

NON-PUBLIC?: N
ACCESSION #: 9408180036
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Salem Generating Station - Unit 1 PAGE: 1 OF 4

DOCKET NUMBER: 05000272

TITLE: Manual Reactor Trip From 100% Power Following Automatic
Tripping Of All Circulating Water Pumps Due To Lightning
Strike.

EVENT DATE: 07/14/94 LER #: 94-011-00 REPORT DATE: 08/11/94

OTHER FACILITIES INVOLVED: DOCKET NO: 05000

OPERATING MODE: 1 POWER LEVEL: 100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR
SECTION:
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:

NAME: F. H. Wiltsee - LER Coordinator TELEPHONE: (609) 339-5163

COMPONENT FAILURE DESCRIPTION:

CAUSE: SYSTEM: COMPONENT: MANUFACTURER:

REPORTABLE NPRDS:

SUPPLEMENTAL REPORT EXPECTED: No

ABSTRACT:

On July 14, 1994, at 2132 hours, during full power operation, a Unit 1 manual reactor trip was initiated due to loss of all CW pumps caused by the undervoltage (UV) tripping of the Circulating Water (CW) System 4KV bus infeed/load breakers. The UV condition resulted from a lightning-induced voltage drop of the 500KV Hope Creek - New Freedom line that transferred to Salem's switchyard via the Salem - Hope Creek tie line. Emergency Operating Procedures were entered and at 2139 hours Main Steam was isolated to limit cooldown of the Reactor Coolant System. The root cause of the event is attributed to Design, Manufacturing, Construction/Installation. The Unit 1 circulating water bus UV protection, installed as part of a switchyard upgrade design change in 1993, included new switchgear containing instantaneous relays. A time delay, which would have precluded UV relay actuation, was not used. Time delay relays with a 700 millisecond setting have now been installed. The protective

relaying technical standard will be revised to provide overall guidance on the selection of UV protective relaying schemes. In addition, specific reference to the CW 4KV bus system will be provided. The Unit 2 switchyard upgrade DCP (which includes CW bus UV protection) will be reviewed and a suitable UV time delay scheme will be incorporated.

END OF ABSTRACT

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PLANT AND SYSTEM IDENTIFICATION:

Westinghouse - Pressurized Water Reactor

Energy Industry Identification System (EIIS) codes are identified in the text as {xx}

IDENTIFICATION OF OCCURRENCE:

Manual Reactor Trip From 100% Power Following Automatic Tripping Of All Circulating Water Pumps Due To Lightning Strike

Event Date: 7/14/94

Report Date: 8/11/94

This report was initiated by Incident Report No. 94-195.

CONDITIONS PRIOR TO OCCURRENCE:

Mode 1 Reactor Power 100% Unit Load 1100 MWe

A severe thunderstorm was in progress with frequent lightning strikes in the vicinity of Artificial Island. Due to the storm, numerous Control Room alarms on both Units were occurring and clearing shortly thereafter, including main generator voltage regulator alarms as well as carrier trouble alarms on the 500 kilovolt (KV) transmission lines.

DESCRIPTION OF OCCURRENCE:

At 2132 hours on July 14, 1994, a Unit 1 manual reactor trip was initiated in response to loss of all CW pumps resulting from undervoltage (UV) tripping of the Unit Circulating Water (CW) System 4KV switchgear bus infeed/load breakers. Automatic starting of 11, 12, and 13 Auxiliary Feedwater pumps occurred due to resultant lo-lo

Steam Generator (SG) levels. Emergency Operating Procedures, EOP-TRIP-1, "Reactor Trip Or Safety Injection" and EOP-TRIP-2, "Reactor Trip Response" were entered and at 2139 hours (same day) Main Steam was isolated to limit cooldown of the Reactor Coolant System (RCS). The Unit was stabilized in Mode 3 and Integrated operating Procedure IOP-8, "Maintaining Hot Standby", was entered.

At 2250 hours (same day) the Nuclear Regulatory Commission (NRC) was notified of this event, in accordance with 10CFR50.72(b)(2)(ii).

ANALYSIS OF OCCURRENCE:

The electrical bus powering the Units' six CW pumps consists of two bus sections (13 and 14) with three pumps per section. Each section

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ANALYSIS OF OCCURRENCE: (cont'd)

is fed by a separate string of transformers: 500/13KV and 13/4KV and is separated from the other section by a normally open tie breaker. System design provides for automatic opening of the feeder breaker to a bus section and automatic closure of the tie breaker upon receipt of any of a number of actuation signals, signifying a faulted condition of the respective infeed. The Unit 1 CW bus UV protection, installed as part of a Unit 1 switchyard upgrade (design change) in 1993, included new switchgear containing new instantaneous relays, General Electric (GE) type NGV.

A manual reactor trip was initiated in response to simultaneous loss (tripping) of all CW pumps due to UV on both CW 4KV buses and line sections (13 and 14). The UV condition existed for approximately 42 milliseconds and resulted from a lightning-induced voltage drop of the 500KV Hope Creek - New Freedom line that transferred to Salem's switchyard via the Salem - Hope Creek tie line. The 500KV grid voltage decreased to 379KV and the CW system 4KV bus voltage decreased to 2.9KV, 69% of bus voltage. No other undervoltage actuations occurred on the other 4KV buses, 4KV vitals use GE type IAV time delay style UV relays which have an inherent time delay built in. The Unit 2 group buses that feed CW did not trip because they use GE type IAV time delay style UV relays. In addition, the group buses are powered from the Auxiliary Power Transformer the output of which remained stable by the on line Main Generator.

The plant response to cooldown was improved over that of prior events; however, closure of the MS167s (Main Steam Isolation Valves)

was required to limit cooldown.

APPARENT CAUSE OF OCCURRENCE:

This event is attributed to "Design, Manufacturing, Construction/ Installation" as classified in Appendix B of NUREG-1022.

The switchyard upgrade design specification did not adequately address the importance of power systems UV protective relaying requirements for individual subparts of the overall design. During development of the switchyard upgrade design change package (DCP), emphasis was focused on providing the ability of the electrical buses to successfully transfer motor loads without immediate or long-term degradation. Consequently, a time delay which would have precluded UV relay actuation was not used.

PREVIOUS OCCURRENCES:

A similar event involving a lightning strike and resultant reactor trip was reported in LER 272/91-024-00 due to a strike in the

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PREVIOUS OCCURRENCES: (cont'd)

vicinity of the Phase B Generator Step-up Transformer. Lightning protection was assessed by Engineering and found to be appropriate.

SAFETY SIGNIFICANCE:

This event is reportable pursuant to the requirements of 10CFR50.73(a)(2)(iv) and did not affect the health and safety of the public. The Reactor Protection System (RPS) {JC} functioned as designed and the heat sink was maintained. The event, i.e. the manual reactor trip, was an anticipatory action to a low vacuum condition resulting from the loss of CW pumps.

CORRECTIVE ACTION:

Time delay relays with a 700 millisecond setting have been installed in the Unit 1 CW bus UV protection scheme to provide the capability of the infeed breaker UV trip logic to withstand short duration undervoltage transients.

Engineering will revise the protective relaying technical standard to provide overall guidance on the selection of undervoltage

protective relaying schemes. In addition, specific reference to the CW 4KV bus system will be provided.

Engineering will review the Unit 2 switchyard upgrade DCP (which includes CW bus UV protection) and incorporate a suitable UV time delay scheme prior to implementation.

Design changes have been implemented to minimize post-trip RCS excessive cooldowns and EOP-TRIP-1 has been revised to provide direction on throttling auxiliary feedwater flow to minimize cooldowns resulting from excessive feedwater flow. Engineering is continuing to assess additional corrective actions to minimize cooldowns following reactor trips.

General Manager -
Salem Operations

MJPJ:pc

SORC Mtg. 94-063

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PSE&G

Public Service Electric and Gas Company P.O. Box 236 Hancocks Bridge,
New Jersey 08038

Salem Generating Station

August 11, 1994

U. S. Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

Dear Sir:

SALEM GENERATING STATION
LICENSE NO. DPR-70
DOCKET NO. 50-272
UNIT NO. 1

LICENSEE EVENT REPORT 94-011-00

This Licensee Event Report is being submitted pursuant to the

requirements of Code of Federal Regulation 10CFR50.73(a)(2)(iv).
Issuance of this report is required within thirty (30) days of event
discovery.

Sincerely yours,

J. J. Hagan
General Manager -
Salem Operations

MJPJ:pc

Distribution

The power is in your hands.

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